Report for Subagreement No. 20 to Cooperative Agreement No. CA9000-95-018 Mammal Inventories, City of Rocks National Reserve

University of Idaho and National Park Service
Columbia Cascades Support Office

December 1, 2003

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Executive Summary

Results from the 2003 City of Rocks National Reserve mammal inventory included species lists and additional information on mammals in the City of Rocks and Castle Rocks area in southeast Idaho. The University of Idaho Department of Fish and Wildlife Resources conducted the 2003 inventory under a cooperative agreement with the National Park Service Northern Semi-Arid Network. Inventory fieldwork was conducted from June 9-13 and July 2 –September 30, 2003. The primary goal of the inventory was to confirm 90% of the species expected to occur within the Reserve. Additional goals included the development of baseline data for monitoring as well as providing the National Park Service and the research community-at-large with new and important information on the biodiversity of the region.

Expected species lists used for the inventory were developed from published literature, historic reports, and expert opinion. A set of four criteria was used to determine the likelihood of detection in the Reserve. Range, elevation, habitat, and species detectability were considered and developed into a criteria set that was used to place species into "expected" or "possible but not expected" categories. Fieldwork in 2003 utilized a variety of methods to achieve the primary objective and maximize the chance of detecting species in the study area, including visual encounter surveys and trapping. Species documentation included the collection of voucher photographs, specimens, digital bat call recordings, and field observation records.

The 2003 mammal inventory was productive and brought species confirmation totals to 75%. Thirty-five species of mammals were confirmed in the Reserve during 2003. The cliff chipmunk (*Tamias dorsalis*), a "peripheral species" in Idaho, was found to be common in the area and the Reserve appears to support a relatively large population of this species. The spotted bat (*Euderma maculatum*) was confirmed in the Reserve in 2003. This species is listed as a species of special concern by the state of Idaho and is poorly known in the state. The hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and pallid bat (*Antrozous pallidus*) were also confirmed in the Reserve for the first time during the 2003 inventory. The deer mouse (*Peromyscus maniculatus*) and the great basin pocket mouse (*Perognathus parvus*) were the two most abundant mammals represented in trapping results. The piñon mouse (*Peromyscus truei*) was reconfirmed in the Reserve for the first time since an unvouchered report was made in 1967. City of Rocks is at the northern limit of the range for this unique species and the voucher specimen for this species collected in 2003 may represent a significant range extension for Idaho. In March of 2003, a ringtail (*Bassariscus astutus*) was found dead in the Castle Rocks area of the Reserve by Idaho Department of Fish and Game personnel. This was the first record of the species in Idaho and also represents a significant northward range extension. The status of this unique and secretive species in the Reserve should be further evaluated in the future.

Data from the 2003 inventory will be incorporated into a long term monitoring program that will focus on selected "vital-signs", including mammals. Future monitoring activities will also provide opportunities to add additional species to the inventory list as they are encountered.

I. Introduction

This report summarizes the results of the 2003 inventory of mammals, summarizes historic information, and contains brief accounts of each species present or expected to occur in the City of Rocks National Reserve. Information on species that are possible but unlikely to occur in the Reserve is also included.

The University of Idaho Department of Fish and Wildlife Resources conducted the 2003 vertebrate inventory in the Reserve under a cooperative agreement with the National Park Service Northern Semi-Arid Network. Inventory fieldwork was conducted from June 9-13 and July 2-September 30, 2003. The inventory is part of a nationwide inventory and monitoring program initiated by the National Park Service Natural Resource Challenge Inventory and Monitoring Program (I& M). In 2000, the Northern Semi-Arid Network, which includes City of Rocks National Reserve, began implementing the inventory phase of the I & M program in several network parks. Historic information available on the plant and animal populations within the network were assembled and an estimate was made of the percent of species expected to occur in each park. City of Rocks was among the majority of parks that has a low percentage (below 50%) of confirmed species of vertebrates and was in need of a concerted effort to meet the I & M goals. In 2001, the Northern Semi-Arid Network, working through University of Idaho, completed a herpetological inventory (Shive and Peterson 2001). A bird inventory was completed by Reserve staff over a period of several years and continues to be updated as new species are encountered. A plant inventory was completed for the Reserve by Tom Johns in 1995.

The primary goal of the inventory phase of the I & M program is to document the presence of 90% of the plant and animal species expected to occur within the park boundary or within a distance to the boundary that is relevant to the biology of the organism and to park management. Secondary goals of the inventory include providing baseline information that will help guide the development of the I & M program's vital signs monitoring strategy. Tertiary goals include providing both the NPS and the research community-at-large new information on the distribution, habitat association, and population status of the nation's biological resources. Ultimately, the I & M program is designed to help the NPS take a leading role in the preservation of the nation's biological diversity. Completing basic biological inventories is a crucial first step in achieving that goal.

II. Study Area

City of Rocks is located in Cassia County, about 4 miles west of Almo, Idaho. The area was designated a National Reserve in 1988 due to its historical and geological significance. The congressional boundaries include a total of 14,107 acres. The National Park Service and the Idaho Department of Parks and Recreation manage the Reserve cooperatively. The Reserve boundary encompasses 4,922 acres administered by the National Park Service, 4,282 acres in private ownership, and 640 acres in state ownership (Wallace Keck personal communication). A map of City of Rocks National Reserve is located in Figure 1 of this document.

City of Rocks sits in the northern region of the Great Basin Desert. It is nestled amidst the mountain peaks of the Albion mountain range. The elevation of the Reserve ranges from 5,650 feet where Circle Creek meets the east boundary of the Reserve to 8,867 feet at Graham Peak, in the northern portion of the park. The climate at the Reserve is semi-arid with hot and dry summers and cold and dry winters. Weather data obtained from a station in Malta, Idaho, 27 miles from the Reserve, show 30-year mean annual precipitation to be 11 inches (Idaho State Climate Service 2003). However, elevation in the Reserve is higher and precipitation is probably higher as well. A significant amount of annual precipitation is contained in a snowpack of variable depth and usually lasts through the winter.

City of Rocks supports several different vegetation types, resulting from the variation in elevation and soils across the Reserve. Vegetation in the lower elevations of the monument is dominated by Wyoming big sage (*Artemisia tridentata wyomingensis)*, and includes gray rabbitbrush (*Chrysothamnus nauseosus*), green rabbitbrush (*Chrysothamnus viscidiflorus*), sandberg's bluegrass (*Poa secunda*), and crested wheatgrass (*Agropyron cristatum*). Woodland vegetation at higher elevations consists of Utah juniper (*Juniperus osteosperma*), piñon pine (*Pinus monophylla*), and mountain mahogany (*Cercocarpus ledifolius*). Riparian habitat consists of quaking aspen (*Populus tremuloides*), willows (*Salix spp.*), and prickly rose (*Rosa acicularis*).

Vegetation in and around City of Rocks has undergone significant changes over time, and likely differs considerably from historic conditions. Grazing, dry-land farming, fire suppression, and developments such as roads and campgrounds have driven much of this change (City of Rocks Resource Management Plan). Wildfires have also contributed to changes in Reserve vegetation. The Emery Canyon area burned in 1992 and again in 1996. Over 2500 acres of Reserve land burned in Emigrant Canyon during a fire in 2000. This area experienced significant erosion following the fire. Invasive weeds including Russian thistle (*Salsola kali*), cheatgrass (*Bromus tectorum*), and crested wheatgrass have become established in many portions of the Reserve (City of Rocks Resource Management Plan). A recent weed mapping effort conducted in the park found new emerging invasions by several exotic plants, including bull thistle (*Cirsium vulgare*) and spotted knapweed (*Centaurea maculosa*). These changes in Reserve vegetation are likely

having a significant impact on mammal populations in the Reserve, although this impact has not been quantified in any way.

III. Methods

The methods utilized in the 2003 inventory generally follow those described in the Northern Semi-Arid Network Study Plan (Wright et. al. unpublished) and published literature on inventory methodologies (i.e. Wilson et. al. 1996). Universal Transverse Mercator (UTM) locations given in this report were collected using Garmin 12-channel Etrex hand-held GPS units (Garmin International, Inc, Olathe, KS, USA). Most x and y coordinates (Eastings and Northings) are accurate within 10 meters. No accuracy estimate is available for elevation data provided by the GPS unit. Locations taken directly from USGS 7.5 minute topographic maps are accurate within approximately 125 meters. UTM locations are in zone 12 and the North American Datum of 1927 (NAD 27) was used as the horizontal datum for all locations.

Scientific and common names used in this report follow the Integrated Taxonomic Information System (ITIS). The ITIS follows closely the USGS Biological Resource Division's unpublished and expanded update of the 1987 Checklist of Vertebrates of the United States, the U.S. Territories, and Canada (ITIS 2003).

The Reserve boundary was used as the primary boundary of the inventory. However, some species that were observed outside the boundary but near the Reserve were included. Flexibility in the boundary was necessary because dispersal abilities of many of the species enable them to move on and off the Reserve. Some species documentations came from observations made near the Reserve's visitor center, which is four miles from the boundary, and also by local residents living adjacent to the boundary.

A. Expected Species

An expected species list was generated for City of Rocks by examining published range maps and species accounts, as well as historic observations made in the Reserve. Range, elevation, habitat, and species detectability were considered and developed into a criteria set that was used to place species into "expected" or "possible but not expected" categories. Detectability was included in the consideration in order to address species that naturally occur in low abundances or are in some other way very difficult to confirm through established mammal survey protocols. Species such as Merriam's shrew (*Sorex merriami*) often require years of consistent trapping to document (Kirkland et. al. 1997, Verts and Carraway 1998) and these species were considered "possible but not expected". Species that met all four criteria were included as "expected" species.

Published and unpublished sources used to determine the range, habitat, and elevation requirements of mammals included Mammals of Idaho (Larrison 1981), Land Mammals of Oregon (Verts and Carraway 1998), Mammals of the Rocky Mountains (Fisher and Hartson 2000), National Audubon Society Field Guide to North American Mammals

(Whitaker 1998), Digital Atlas of Idaho (2003), Ground Squirrels of the Pacific Northwest (Yensen and Sherman 2003), and Atlas of Idaho Wildlife (Groves et. al. 1997). Several historic reports from previous research done in the Reserve were also reviewed, including Monello and Wright (1998), bat mist netting results from 1995-2000 (Lewis, unpublished), as well as observations from Reserve staff.

B. Sampling Site Selection

A subjective, non-random sampling site selection procedure was adopted for the 2003 inventory. This approach was determined to be the most efficient and effective given the primary objective of the inventory and the limited number of field personnel. Specific habitats and locations were identified and targeted for sampling in order to maximize the opportunities to encounter as many previously undocumented species as possible. While a majority of the inventory effort was concentrated near roads and trails due to logistical considerations, effort was made to periodically search more remote portions of the Reserve in order to ensure adequate dispersion of sampling locations. Seasonal changes in species presence or detectability were also an issue and required multiple visits to sites over the course of the year. For example, summer torpor in ground squirrels made follow-up visits in early autumn necessary.

C. Visual Encounter Surveys

Visual encounter surveys and incidental observations were important tools in the 2003 mammal inventory. Visual encounter surveys were conducted by methodically searching target habitats. Surveys were conducted during different times of the day, including nighttime hours. Jackrabbit surveys were conducted in the early mornings and also late at night using a flashlight. Pygmy rabbit surveys were done during the day, in order to locate burrow systems and look for sign. Incidental observations made of all mammals in or near the Reserve during travel and other inventory activities were included under the visual encounter category. Incidental observations contributed significantly to the overall success of the 2003 inventory and enabled participation from volunteers and NPS staff. Information recorded during visual encounter surveys included time, location, habitat, and notes of interest

D. Road Surveys

Road surveys were also conducted in the mammal inventory. The small number of roads at City of Rocks limited the overall usage of this technique; however it did lead to the documentation of rabbit species, along with chipmunks and the long-tailed weasel. Road surveys were conducted throughout the day and into the evenings when nocturnal species were likely to be encountered.

E. Trapping

A variety of trapping techniques were used to inventory small mammals and bats and generally followed procedures outlined in Jones et. al. (1996), Cooperrider et. al. (1986), Kunz (1988), and the Northern Semi-Arid Network Study Plan. Capture and handling procedures were consistent with those outlined by the Ad Hoc Committee on Acceptable Field Methods in Mammalogy (1987) and the University of Idaho Institutional Animal Care and Use Committee.

1. Small Mammals

The primary technique used for small mammals involved the use of Sherman live traps and Museum Special snap traps placed along 150-meter transects. Trap stations were established approximately every 15 meters and 1 live trap and 1 snap trap were placed at each station. Transects were pre-baited for 0 to 1 day, and traps were set for 4 consecutive nights. Traps were placed within 2 meters of the transect center and were placed non-randomly near microhabitat features and mammal sign in order to maximize capture success. Traps were baited with peanut butter, crimped oats, and black oil sunflower seeds. Miscellaneous trapping techniques included the use of Havahart wire cage traps targeted for skunks and weasels and Museum Special snap traps baited for shrews with liver paste and placed near water. Ancillary data collected with small mammal captures included time, date, location, weather, moon phase, topography, age, sex, and habitat.

2. Bats

Two nights of mist netting were conducted on August 8 and 9, 2003. Mist netting generally followed methods outlined in Kunz (1988). Mist nets designed specifically for bats (i.e. 38mm mesh size with reduced bag) were placed over water at Circle Creek and across a stock pond near the Castle Rock portion of the Reserve. A range of net lengths (6, 9, and 18 meters) was used in different arrays in response to topographic and strategic considerations. Nets were opened at sunset and kept open for 3 hours after sunset. Ancillary data collected with bat captures included time of capture, date, location, weather, time of sunset, moon phase, age, sex, reproductive condition, forearm length, and habitat. An *Anabat* bat echolocation call recording and analysis system (Titley Electronics, Ballina, NSW, Ausralia; Corben Scientific, Rohnert, CA, USA) was used to record and analyze the ultrasonic calls emitted by bats during foraging and commuting. The *Anabat* system consisted of an *Anabat II* bat detector, type 6 standard Zero-Crossings Analysis Interface Module, an IBM-compatible laptop, *Anabat 6* software, and *Analook* software. A 12-volt 100-watt handheld spotlight was used during recording sessions to illuminate flying bats and provide visual cues to aid in species identification. Species identification of free-flying bats was the primary application of *Anabat* in the inventory, although information on bat activity was also obtained from the use of *Anabat*. Recorded calls of bats were compared with an existing library of *Anabat* call files developed by

releasing and recording bats captured and identified in the hand. The library was used to enhance the species identification of calls recorded from free-flying bats. The *Anabat* system was used simultaneously during mist netting sessions. Ancillary information collected with *Anabat* recording included time and location. A set of voucher calls for each species documented with *Anabat* is included in Appendix A of this report.

F. Species Documentation Methods

Species encountered during the inventory were documented using photography, collection of voucher specimens, voucher *Anabat* call files, and field observation records. The use of Museum Special snap traps resulted in the killing of some individuals of certain species of small mammals. Mammals found dead on the road were also kept and skulls and study skins will be prepared and curated by University of Washington's Burke Museum of Natural History in Seattle, Washington. Table 4 lists the voucher specimens collected in the monument during 2003. Photocopies have been made of all data sheets and field notes which will be permanently housed by the NPS Northern Semi-Arid Network office in Moscow, Idaho.

IV. Results

A. Historic Information

No comprehensive mammal inventory has been conducted prior to the 2003 inventory. However, several mammal research efforts have been conducted on the Reserve. Some limited information on mammals in City of Rocks is described by Larrison (1981). Wildlife observation cards completed by CIRO staff and visitors during the 1980's and 90's contain most of the historic information. Lyle Lewis made annual mist netting visits to a single location in the Reserve from 1995-2000 (Lewis unpublished data). Ryan Monello conducted a limited amount of small mammal trapping in the mid 1990's (Monello and Wright 1998). A long-term mountain lion (*Felis concolor*) study was conducted in the area around the Reserve and several individual cats were tracked through the Reserve at various times (Laundre et. al. 1993). Information on species with federal or state conservation status was made available from the Idaho Bureau of Land Management Special Status Animal Species list.

B. Expected and Confirmed Species

A total of 47 species of mammals are expected to occur in or adjacent to City of Rocks. Thirty-five species were documented in 2003. Total confirmed species was 75% of expected species. Table 1 shows the list of expected and possible species and their current status in the 2003 inventory.

C. Mammal Trapping

Trapping effort for small and medium sized non-volant mammals totaled 2742 trap nights. Sherman live traps and Museum Special snap traps placed in transects represent 95% of these trap nights, but Havahart wire cage traps, and pitfall traps were also used and are included in this total. Total capture of non-volant mammals was 873 individuals. Deer mice were the most abundant mammals captured, representing 69% of all captures. The great basin pocket mouse was the second most abundant mammal captured, representing 18% of all captures. Table 2 shows the location and trapping effort information and Table 3 shows the results from the 2003 mammal trapping effort. Figure 2 shows the location of transects, mist nets, and miscellaneous capture locations.

D. Bat Mist Netting

Two mist net sessions were conducted during 2003. Both nights produced far fewer captures than expected. Windy conditions negatively affected capture efforts on August 9. No captures were made along Circle Creek and only 2 species, the little brown myotis (*Myotis lucifugus*) and the western-small footed Myotis (*Myotis ciliolabrum*) were captured at the stock pond near Castle Rocks. One spotted bat (*Euderma maculatum*)

was heard flying high over the pond on August 9. This species is notoriously difficult to capture but produces distinctive echolocation calls that are readily distinguished from other Idaho bat species (Fenton et. al. 1987). This species is quite rare in Idaho and considered a species of special concern by the state (Digital Atlas of Idaho 2003, Luce in press). Figure 2 shows the location of the mist netting sessions conducted in the Reserve in 2003. Locations are labeled with the date of activity.

E. Bat Acoustic Survey Results

Anabat recording sessions were conducted simultaneously with mist netting on August 8 and 9, 2003. On August 8, 5 species were confirmed through call files and visual cues. Three species, the pallid bat (*Antrozous pallidus*), silver-haired bat (*Lasionycteris noctivagans)*, and the hoary bat (*Lasiurus cinereus*), were previously undocumented in the monument. The big brown bat (*Eptesicus fuscus*), and the long-eared myotis (*Myotis evotis*) were also seen and recorded during this session. A number of 40 Khz calls made by unidentified myotis were recorded as well. Tentative identification on some of these calls has been made as being of the western small-footed myotis. Only two species, the big brown bat and pallid bat, were confirmed on August 9th, but several 40Khz myotis calls were recorded there as well. The spotted bat that flew over the pond on August 9th was too high to be recorded.

F. Discussion

The 2003 mammal inventory began with little historic information and therefore was conducted on a relatively "blank slate". Several interesting discoveries were made during the inventory and there were some species of mammals confirmed that had no historic documentation in the Reserve prior to 2003. The discovery of the cliff chipmunk in the Reserve was certainly the most exciting event for the mammal inventory in 2003. Little is known about this species in Idaho and the species is believed to be rare in the state. An unvouchered report of the species in the Reserve area was made by Larrison in 1967. The cliff chipmunk has been placed on the BLM list for peripheral species in Idaho, meaning the species is generally rare and does a majority of its breeding outside of the state (Idaho BLM Special Status Animal Species). Cliff chipmunks were found along cliffs and rocky areas of piñon pine habitat in the Reserve.

The discovery of the piñon mouse was also exciting. Although an unvouchered report of the species in the Reserve area was made by Larrison in 1967, most published range maps show the species only occurs in Idaho in the Owyhee Mountains, approximately 150 miles to the west (Larrison 1981, Verts and Carraway 1998, Digital Atlas of Idaho 2003). The distribution of this species in Idaho is poorly documented and the rediscovery of the species in the park provides an important contribution to the natural history of this unique rodent. A voucher specimen of the piñon mouse collected in the Reserve during the 2003 inventory will be permanently housed in the University of Washington' Burke Museum of Natural History.

Both the long-tailed vole (*Microtus longicaudous*) and the montane vole (*Microtus Montanus*) were expected and confirmed at City of Rocks in 2003. These two species were found in riparian aspen groves and along Circle Creek. Captures of these species were fewer than expected. Voles have cyclical population fluctuations and the low captures of these species in 2003 may indicate that vole populations were in a low point of the cycle in 2003.

Shrews (family Soricidae) were another group of interest for the 2003 mammal inventory. No species of this family were documented in 2003 but two species may occur in or near the Reserve. An unidentified species of shrew was captured in the Reserve in the mid-1990's (Monello and Wright 1998). While detectability of Merriam's shrew is very low and not expected, the vagrant shrew (*Sorex vagrans*) was expected to be found in riparian areas of the park but were not encountered. The shrew reported in Monello and Wright (1998) was probably a vagrant shrew. Neither the vagrant shrew nor the Merriam's shrew is well understood in Idaho and any information on these two species gathered from the Reserve in the future will make a significant contribution to the understanding of the ecology and conservation of these unique and often overlooked mammals.

The western harvest mouse (*Reithrodontomys megalotis*) was not found in the Reserve during the 2003 inventory. This was surprising and the species remains expected for City of Rocks. The Reserve is well within the range of the western harvest mouse and the species has been frequently captured during inventories at other parks in the network. The harvest mouse was found in Hagerman Fossil Beds National Monument and Craters of the Moon National Monument during inventory work conducted in 2003. City of Rocks contains suitable habitat and the absence of the species is conspicuous.

The pygmy rabbit may occur in the monument. Searches were conducted for any sign of this species in areas of suitable habitat in the Reserve. Visits were made to another area in southern Idaho where the species is relatively abundant. Comparisons of habitat, pellets, and burrows seen there with those encountered in the Reserve were inconclusive. While the sagebrush habitat favored by this species is abundant in the Reserve, it is not entirely clear whether all habitat components, such as soil characteristics, are present. This species has recently been listed as threatened under the U.S. Endangered Species Act and future efforts should be made to confirm habitat suitability in City of Rocks and to further evaluate burrow and pellet sign. Reserve staff should be encouraged to learn how to differentiate pygmy rabbit sign from that of the mountain cottontail (*Sylvilagus nuttalii*) in order to avoid misidentifications.

Species that were expected to be present in the Reserve but were not documented during this inventory include: vagrant shrew *Sorex vagrans;* Yuma Myotis *Myotis yumanensis;* Townsend's Big-eared Bat *Corynrhinus townsendii*; Belding's Ground Squirrel *Spermophilus beldingi*; Western Harvest Mouse *Reithrodontomys megalotis*; Sagebrush Vole *Lemmiscus curtatus*; Northern Grasshopper Mouse *Onychomys leucogaster;* Canyon Mouse *Peromyscus crinitus*; Desert Woodrat *Neotoma lepida*; Red Fox *Vulpes vulpes*; Western Spotted Skunk *Spilogale gracilis*; and Pronghorn *Antilocapra Americana*.

V. Species Accounts

This section gives a brief description of each expected or unexpected but possible species for City of Rocks. The mammals are divided into expected and unexpected. Species names are followed by a series of codes based on those in use by the National Parks Service NPSpecies database. The first code indicates status of the species during the 2003 inventory, followed by an indication of species abundance, and species residency. A question mark (?) is used to indicate lack of information and a possible or probable status for a given code (i.e. B? = unconfirmed but possible breeder at CIRO). Because many mammals are nocturnal and secretive, the assignment of an abundance code is based on appropriate trapping methods. For example, deer mice, here considered "abundant", are not seen on a "daily basis in relatively large numbers" unless small traps are used. The information presented here is primarily based on the 2003 inventory results and is not comprehensive and should be interpreted carefully. A key to the codes used after the species names is located on the following page.

NPSpecies Codes

CIRO Status

- **(P) Present:**
  Species occurrence in CIRO is documented and assumed to be extant.
- **(H) Historic:**
  Species historical occurrence in the CIRO is documented, but recent investigations indicate that the species is now probably absent.
- **(PP) Probably Present:**
  CIRO is within species range and contains appropriate habitat. Documented occurrences of the species in the adjoining region of the CIRO give reason to suspect that it probably occurs within the CIRO. The degree of probability may vary within this category, including species that range from common to rare.
- **(E) Encroaching**
  The species is not documented in the CIRO, but is documented as being adjacent to the CIRO and has potential to occur in the CIRO.
- **(U) Unlikely:**
  Included for the CIRO based on weak (unconfirmed) record or no evidence, giving minimal indication of the species occurrence in the CIRO.
- **(FR) False Report:**
  Species previously reported to occur within the CIRO, but current evidence indicates that the report was based on a misidentification, a taxonomic concept no longer accepted, or some other similar problem of interpretation.

Species Abundance

- **(A) Abundant:**
  Animals: May be seen daily, in suitable habitat and season, and counted in relatively large numbers.
  Plants: Large number of individuals; wide ecological amplitude or occurring in habitats covering a large portion of the CIRO.
- **(C) Common:**
  Animals: May be seen daily, in suitable habitat and season, but not in large numbers.
  Plants: Large numbers of individuals predictably occurring in commonly encountered habitats but not those covering a large portion of the CIRO.
- **(U) Uncommon:**
  Animals: Likely to be seen monthly in appropriate season/habitat. May be locally common.
  Plants: Few to moderate numbers of individuals; occurring either sporadically in commonly encountered habitats or in uncommon habitats.
- **(R) Rare:**
  Animals: Present, but usually seen only a few times each year.
  Plants: Few individuals, usually restricted to small areas of rare habitat.
- **(O) Occasional:**
  Occurs in the CIRO at least once every few years, but not necessarily every year. Applicable to animals only.
- **(UNK) Unknown:**
  Abundance unknown.

Residency

- **(B) Breeder:**
  Population reproduces in the CIRO.
- **(R) Resident:**
  A significant population is maintained in the CIRO for more than two months each year, but it is not known to breed there.
- **(M) Migratory:**
  Migratory species that occurs in CIRO approximately two months or less each year and does not breed there.
- **(V) Vagrant:**
  CIRO is outside of the species usual range.
- **(UNK) Unknown:**
  Residency status in CIRO is unknown.

A. Expected Species

Vagrant Shrew *Sorex vagrans* Probably Present

California Myotis *Myotis californicus* Present U UNK

This species was captured in the Reserve in 1998.

Western Small-footed Myotis *Myotis ciliolabrum* Present C B

This species was captured in the Reserve in 1996 and 1998 and was tentatively confirmed producing many of the 40 Khz calls recorded in 2003.

Long-eared Myotis *Myotis evotis* Present C B

This species was frequently captured from 1995-2000 and was recorded at Circle Creek in 2003.

Little Brown Myotis *Myotis lucifugus* Present C B

This species was captured in 2003 and in prior efforts.

Fringed Myotis *Myotis thysanodes* Present R UNK

This species was captured in the monument in 1999 but appears to be rare in the monument.

Long-legged Myotis *Myotis volans* Present U UNK

The species was captured in the Reserve in 1995.

Yuma Myotis *Myotis yumanensis* Probably Present

Hoary Bat *Lasiurus cinereus* Present UNK UNK

This species was recorded briefly along Circle Creek in 2003.

Silver-haired Bat *Lasionycteris noctivagans* Present UNK UNK

This species was seen and recorded foraging over a pool along Circle Creek in 2003.

Big Brown Bat *Eptesicus fuscus* Present C B

This species appears to be abundant in Reserve vicinity. It has been frequently captured in the Reserve and was seen and recorded frequently during efforts in 2003.

Spotted Bat *Euderma maculatum* Present UNK UNK

This species was heard in 2003 flying over the stock pond near Castle Rocks and was reportedly heard in 1997 by Lyle Lewis near Twin Sisters.

Townsend's Big-eared Bat *Corynrhinus townsendii* Probably Present

Pallid Bat *Antrozous pallidus* Present U B?

This species was seen and recorded multiple times over a small pool along Circle Creek in 2003.

Mountain Cottontail *Sylvilagus nuttallii* Present A B

The mountain cottontail occurs throughout the Reserve.

Black-tailed Jackrabbit *Lepus californicus* Present A B

This species occurs throughout the Reserve.

Cliff Chipmunk *Tamias Dorsalis* Present U B

The cliff chipmunk was found near the main road through the Reserve in the piñon pine and rocky habitats. This species was an exciting find and is considered to be rare in Idaho.

Least Chipmunk *Tamias minimus* Present C B

The least chipmunk was trapped in sagebrush and rocky areas. It was commonly seen near campsites and crossing the main road leading through the Reserve.

Yellow-bellied Marmot *Marmota flaviventris* Present U B

The yellow-bellied marmot appears to occur in only one distinct location in the Reserve. It was found near campsite 74 along the National Forest Service Road leading into the Sawtooth National Forest.

Golden-mantled Ground Squirrel *Spermophilus lateralis* Present C B

This species was observed in all areas of the Reserve. They were especially abundant in campsites and also in the Twin Sisters area.

Belding's Ground Squirrel *Spermophilus beldingi* Probably Present

Paiute Ground Squirrel *Spermophilus mollis* Present U B

The Paiute ground squirrel was found in the southern area of the Reserve. Its mounds were located near many of the campsites. The species began summer torpor in early July.

Northern Pocket Gopher *Thomomys talpoides* Present C B

The northern pocket gopher was identified by its mounds that were located throughout the Reserve.

Great Basin Pocket Mouse *Perognathus parvus* Present A B

The great basin pocket mouse was abundant throughout the Reserve, particularly in sage steppe grasslands, but it was also found in riparian and piñon pine area of the Reserve.

Ord's Kangaroo Rat *Dipodomys ordii* Present U B

This species occurred in loose sandy soil and bunchgrass.

Western Jumping Mouse *Zapus princeps* Present U B

The western jumping mouse was found along riparian areas. The species was particularly abundant along Circle Creek.

Western Harvest Mouse *Reithrodontomys megalotis* Probably Present

Deer Mouse *Peromyscus maniculatus* Present A B

This ubiquitous species was the most abundant mammal in the 2003 inventory and occurs throughout the Reserve.

Northern Grasshopper Mouse *Onychomys leucogaster* Probably Present

Canyon Mouse *Peromyscus crinitus* Probably Present

Desert Woodrat *Neotoma lepida* Probably Present

Bushy-tailed Woodrat *Neotoma cinerea* Present A B

This species occurs throughout the Reserve, particularly in cliffs and rock crevices.

Montane Vole *Microtus montanus* Present C B

The montane vole occurs in many areas of the Reserve, especially near riparian areas and aspen groves.

Long-tailed Vole *Microtus longicaudus* Present R B

Two individuals of this species were captured near a dense stand of aspen.

Sagebrush Vole *Lemmiscus curtatus* Probably Present

Piñon Mouse *Peromyscus truei* Present C B

Piñon mice were found primarily where piñon pines and granite cliffs coincided at higher elevations. Areas with particular abundance were the rocky cliffs near Granite Peak, they were also found in the Castle Rocks area in similar habitats.

Common Muskrat *Ondatra zibethicus* Present R B

One muskrat was observed on one occasion along Circle Creek.

Porcupine *Erethizon dorsatum* Present U B

The porcupine was confirmed by one of the Reserve rangers, whose dogs frequently return from outings with quills embedded in their muzzles.

Coyote *Canis latrans* Present C B

This species occurs throughout the Reserve and is frequently heard calling at night.

Red Fox *Vulpes vulpes* Probably Present

Common Raccoon *Procyon lotor* Present R B

The raccoon was identified from a road kill near the Reserve boundary.

Long-tailed Weasel *Mustela frenata* Present U B

This species was found in many different habitats in the Reserve. One was trapped in a riparian area and another was trapped in a small grassy meadow on the edge of an aspen stand. Two weasels were observed crossing a road in sagebrush.

American Badger *Taxidea taxus* Present U B

This species occurs throughout the Reserve, especially near ground squirrel colonies. One badger was seen and many fresh and abandoned badger excavations and sign were encountered in 2003.

Striped Skunk *Mephitis mephitis* Present U B

This species occurs near riparian areas. One individual was captured at Circle Creek.

Western Spotted Skunk *Spilogale gracilis* Probably Present

Mountain Lion *Felis concolor* Present R UNK

Cougars are secretive and hard to document but occur periodically in the Reserve. A Reserve ranger has seen two walking along the entrance road in recent years. In November of 2003 a male cat was treed by dogs near a parking lot in the park.

Bobcat *Lynx rufus* Present R UNK

Bobcats are secretive and hard to document but likely occur throughout the Reserve. One individual was observed by the Reserve superintendent in 2000

Mule Deer *Odocoileus hemionus* Present C B

This species occurs throughout the Reserve.

Pronghorn *Antilocapra americana* Probably Present

B. Unexpected Species

Water Shrew *Sorex palustris* Unlikely

This species prefers fast flowing streams and wet meadows, which are not available in the Reserve.

Merriam's Shrew *Sorex merriami* Unlikely

This species is rare throughout its range and habitat and elevational requirements of the species are not well understood. While the species may occur in the sagebrush areas of the monument, it is not expected nor is it likely to be detected.

Pygmy Rabbit *Brachylagus idahoensis* Unlikely

This species is patchily distributed across the sagebrush steppe of the Pacific Northwest and its distribution is restricted by specific habitat requirements. While the species may occur in the sagebrush areas of the monument, it is not expected. Detectability of the species based on sign is relatively good, and searches made in the Reserve in 2003 failed to detect positive evidence fo the species' presence.

White-tailed Jackrabbit *Lepus townsendii* Unlikely

The White-tailed Jack Rabbit has been observed 45 miles from the Reserve boundary, but have not been confirmed in the Reserve. The species prefers more open grasslands than what are available in the Reserve and, while the species may occur in the Reserve, it is not expected.

Yellow Pine Chipmunk *Tamias amoenus* Unlikely

This species is more likely to be found in ponderosa pine habitats that are not available near the monument.

Red squirrel *Tamiasciurus hudsonicus* Unlikely

This species is normally found in more extensive stands of fir and pine than what are available in the Reserve.

Beaver *Castor canadensis* Unlikely

Insufficient riparian habitats are available to support this species in the monument.

Ringtail *Bassariscus astutus* Present UNK UNK

This unique and secretive species was found in the Castle Rocks area of the Reserve by Idaho Department of Fish and Game personnel in March, 2003. The individual was apparently killed by a predator. This is the first record of the species in Idaho and represents a significant northward range extension. However, the Reserve provides suitable habitat for the species and it is certainly possible that the species is becoming established in the region.

Ermine *Mustela erminea* Unlikely

This species is normally found in areas with more timber and moister habitats than are available in the Reserve.

Mink *Mustela vison* Unlikely

This species is normally found in areas with more extensive riparian habitats than are available in the Reserve.

Elk *Cervus elaphus* Unlikely

This species is absent from the region around City of Rocks.

Acknowledgements

The 2003 City of Rocks National Reserve mammal inventory was made possible through a cooperative agreement between the National Park Service Northern Semi-Arid Inventory and Monitoring Network and the University of Idaho Department of Fish and Wildlife Resources. We would like to extend a special thanks to Gerry Wright of the USGS Idaho Cooperative Wildlife Research Unit and Wallace Keck, Reserve superintendent, for providing leadership, direction, and enthusiasm for the project. We are also indebted to the City of Rocks staff for providing support and contributing natural history sightings to us. Dr. Leon Powers, of Northwest Nazarene University, provided training and materials. BLM biologist Peggy Bartels provided invaluable information on expected species, including the cliff chipmunk and other species. Dr. Janet Rachlow and her graduate students from the University of Idaho provided training on pygmy rabbit surveys.

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Table 1. The list of expected and possible mammal species in the City of Rocks National Reserve and their documentation status in the 2003 inventory.

Common Name	Scientific Name	Confirmed 2003	Expected
Water Shrew	Sorex palustris	0	0
Vagrant Shrew	Sorex vagrans	0	1
Merriam's Shrew	Sorex merriami	0	0
Western Small-footed Myotis	Myotis ciliolabrum	1	1
Long-legged Myotis	Myotis volans	1	1
Long-eared Myotis	Myotis evotis	1	1
Yuma Myotis	Myotis yumanensis	0	1
Little Brown Myotis	Myotis lucifugus	1	1
Fringed Myotis	Myotis thysanodes	1	1
Pallid Bat	Antrozous pallidus	1	1
Hoary Bat	Lasiurus cinereus	1	1
Silver-hair Bat	Lasionycteris noctivagens	1	1
Big Brown Bat	Eptesicus fuscus	1	1
Townsend's Big-eared Bat	Corynorhinus townsendii	0	1
Spotted Bat	Euderma maculatum	1	1
Black-tailed Jackrabbit	Lepus californicus	1	1
White-tailed Jackrabbit	Lepus townsendii	0	0
Pygmy Rabbit	Brachylagus idahoensis	0	0
Mountain Cottontail	Sylvilagus nuttallii	1	1
Yellow Pine Chipmunk	Tamias amoenus	0	0
Cliff Chipmunk	Tamias dorsalis	1	1
Least Chipmunk	Tamias minimus	1	1
Yellow-bellied Marmot	Marmota flaviventris	1	1
Red Squirrel	Tamiasciurus hudsonicus	0	0
Golden-mantled Ground Squirrel	Spermophilus lateralis	1	1
Belding's Ground Squirrel	Spermophilus beldingi	0	1
Paiute Ground Squirrel	Spermophilus mollis	1	1
Northern Pocket Gopher	Thomomys talpoides	1	1
Great Basin Pocket Mouse	Perognathus parvus	1	1
Ord's Kangaroo Mouse	Dipodomys ordii	1	1
Beaver	Castor canadensis	0	0
Western Jumping Mouse	Zapus princeps	1	1
Western Harvest Mouse	Reithrodontomys megalotis	0	1
Deer Mouse	Peromyscus maniculatus	1	1
Pinyon Mouse	Peromyscus truei	1	1
Northern Grasshopper Mouse	Onychomys leucogaster	0	1
Canyon Mouse	Peromyscus crinitus	0	1
Desert Woodrat	Neotoma lepida	0	1
Bushy-tailed Woodrat	Neotoma cinerea	1	1
Montane Vole	Microtus montanus	1	1
Long-tailed Vole	Microtus longicaudis	1	1

Common Name	Scientific Name	Confirmed 2003	Expected
Sagebrush Vole	Lemmiscus curtatus	0	1
Muskrat	Ondatra zibethicus	1	1
Porcupine	Erethizon dorsatum	1	1
Coyote	Canis latrans	1	1
Red Fox	Vulpes vulpes	0	1
Raccoon	Procyon lotor	1	1
Ringtail	Bassariscus astutus	1	0
Long-tailed Weasel	Mustela frenata	1	1
Ermine	Mustela erminea	0	0
Mink	Mustela vison	0	0
Badger	Taxidea taxus	1	1
Striped Skunk	Mephitis mephitis	1	1
Western Spotted Skunk	Spilogale gracilis	0	1
Mountain Lion	Felis concolor concolor	1	1
Elk	Cervus elaphus	0	0
Mule Deer	Odocoileus	1	1
Pronghorn	Antilocapra americana	0	1
Total		**36**	**47**
Total % Confirmed[a]		**0.75**	

[a] This percentage does not include the ringtail, which was confirmed in 2003 but was not an expected species.

Table 2. The location, trap type, and number of trap nights for each transect employed during the 2003 mammal inventory at City of Rocks National Reserve.

Transect	Date	UTM X	UTM Y	Legal Description	Trap Nights	Trap Type
Tran001	6/9/03	0278458	4661564	T15S R24E S32	80	Sherman
Tran002	6/9/03	0278488	4661585	T15S R24E S32	80	Sherman/Snap
Tran003	6/9/03	0277191	4662867	T15S R24E S30	80	Sherman
Tran004	6/9/03	0277003	4662729	T15S R24E S30	40	Sherman
Tran005	7/2/03	0274547	4662421	T15S R23E S36	80	Sherman
Tran006	7/2/03	0274497	4662467	T15S R23E S35	80	Sherman
Tran007	7/2/03	0278083	4661061	T15S R24E S32	80	Sherman
Tran008	7/2/03	0278174	4661020	T15S R24E S32	80	Sherman
Tran009	7/6/03	0274518	4663198	T15S R23E S26	60	Sherman
Tran010	7/6/03	0275702	4661191	T15S R23E S36	60	Sherman
Tran011	7/6/03	0275732	4661156	T15S R23E S36	42	Sherman
Tran012	7/12/03	0274419	4662882	T15S R23E S26	80	Sherman
Tran013	7/12/03	0275137	4657791	T14S R23E S13	80	Sherman
Tran014	7/12/03	0278144	4663212	T15S R24E S29	80	Sherman
Tran015	7/13/03	0278024	4663081	T15S R24E S29	80	Sherman
Tran016	7/21/03	0274178	4662591	T15S R23E S26	40	Sherman
Tran017	7/21/03	0274183	4662657	T15S R23E S26	40	Sherman
Tran018	7/21/03	0274372	4662974	T15S R23E S26	40	Sherman
Tran019	7/21/03	0276459	4660747	T15S R24E S31	40	Sherman
Tran020	7/21/03	0275335	4661623	T15S R23E S36	10	Sherman
Tran021	7/21/03	0278429	4661323	T15S R24E S32	40	Sherman
Tran022	7/22/03	0278688	4661378	T15S R24E S32	30	Sherman
Tran023	7/22/03	0275040	4661491	T15S R23E S36	30	Sherman
Tran024	7/22/03	0276489	4662415	T15S R24E S30	30	Sherman
Tran025	7/25/03	0273779	4662590	T15S R23E S26	20	Sherman
Tran026	7/25/03	0273822	4662810	T15S R23E S26	20	Sherman
Tran027	7/25/03	0278095	4663277	T15S R24E S30	40	Sherman
Tran028	7/25/03	0278023	4663265	T15S R24E S29	40	Sherman
Tran029	7/25/03	0277870	4662846	T15S R24E S29	40	Sherman/Snap
Tran030	7/25/03	0276420	4662625	T15S R24E S30	40	Sherman
Tran031	7/25/03	0276405	4662761	T15S R24E S31	40	Sherman
Tran032	7/30/03	0279768	4668181	T15S R24E S9	40	Sherman
Tran033	7/30/03	0279778	4668191	T15S R24E S9	40	Sherman
Tran034	7/30/03	0279731	4667621	T15S R24E S9	40	Sherman
Tran035	7/30/03	0279753	4667573	T15S R24E S9	40	Sherman
Tran036	7/30/03	0279446	4666891	T15S R24E S17	40	Sherman
Tran037	7/30/03	0279430	4666892	T15S R24E S17	40	Sherman
Tran038	8/6/03	0273244	4663235	T15S R23E S26	40	Sherman
Tran039	8/6/03	0273238	4663186	T15S R23E S26	40	Sherman
Tran040	8/6/03	0275166	4661327	T15S R23E S40	40	Sherman
Tran041	8/6/03	0275187	4661329	T15S R23E S36	40	Sherman

Transect	Date	UTM X	UTM Y	Legal Description	Trap Nights	Trap Type
Tran042	8/6/03	0276164	4663304	T15S R24E S30	40	Sherman
Tran043	8/6/03	0276249	4663142	T15S R24E S30	40	Sherman
Tran044	8/6/03	0273625	4664533	T15S R23E S23	40	Sherman
Tran045	8/6/03	0273615	4664556	T15S R23E S23	40	Sherman
Tran046	8/18/03	0278080	4663118	T15S R24E S29	40	Sherman
Tran047	8/18/03	0278124	4663232	T15S R24E S29	40	Sherman
Tran048	8/18/03	0276408	4662766	T15S R24E S30	40	Sherman/Snap
Tran049	8/18/03	0276493	4662434	T15S R24E S30	40	Sherman/Snap
Tran050	8/23/03	0274471	4666240	T15S R23E S14	40	Sherman
Tran051	8/23/03	0274408	4666252	T15S R23E S14	40	Sherman
Tran052	8/23/03	0274576	4665068	T15S R23E S23	40	Sherman
Tran053	8/23/03	0278597	4661592	T15S R24E S32	40	Sherman/Snap
Tran054	9/27/03	0273021	4656198	T14S R23E S23	40	Sherman
Tran055	9/27/03	0273033	4656275	T14S R23E S23	40	Sherman
Tran056	9/27/03	0275015	4657778	T14S R23E S13	40	Sherman
Tran057	9/27/03	0278729	4661614	T15S R24E S32	40	Sherman
Tran058	9/27/03	0274711	4662168	T15S R23E S36	40	Sherman
Tran059	9/27/03	0274679	4662114	T15S R23E S36	40	Sherman
Mist01	8/8/03	0278740	4661618	T15S R24E S32	-	Mist Net/Anabat
Mist02	8/9/03	0281299	4666967	T15S R24E S10	-	Mist Net/Anabat
Total					**2742**	

Table 3. The results of non-volant mammal trapping in City of Rocks National Reserve during 2003.

	Species[a]													
Transect	**PEMA**	**PETR**	**PEPA**	**DIOR**	**NECI**	**TAMI**	**TADO**	**MIMO**	**MILO**	**SPLA**	**SPMO**	**MUFR**	**ZAPR**	**TOTAL**
Tran001	11		3										3	17
Tran002	12		3					1						16
Tran003	9		7											16
Tran004	12				3									15
Tran005	24		1		1	1		3	2					32
Tran006	19		1		2						1			23
Tran007	18		2		2	4				3				29
Tran008	13		1		2	1				5				22
Tran009	9													9
Tran010	5		8	4										17
Tran011	7		4											11
Tran012	13		11		1	1			1					27
Tran013	16					1				1				18
Tran014	10	2	15											27
Tran015	9	2	10		3									24
Tran016	12		2			3								17
Tran017	15		1			4								20
Tran018	11		4											15
Tran019	15		5											20
Tran020	3		1											4
Tran021	5		3		3	1	1			1				14
Tran022	15					3								18
Tran023	9							3						12
Tran024	10													10
Tran025	2													2

	Species[a]													
Transect	**PEMA**	**PETR**	**PEPA**	**DIOR**	**NECI**	**TAMI**	**TADO**	**MIMO**	**MILO**	**SPLA**	**SPMO**	**MUFR**	**ZAPR**	**TOTAL**
Tran026	3													3
Tran027	13		8	2										23
Tran028	10		6	1										17
Tran029	12		1											13
Tran030	12												2	14
Tran031	17		1											18
Tran032	6	1	5											12
Tran033	7		1		3		1							12
Tran034	11		2											13
Tran035	11		5											16
Tran036	22		1											23
Tran037	8		4											12
Tran038	10		1			2								13
Tran039	10		4											14
Tran040	17					2								19
Tran041	21					1								22
Tran042	6		3											9
Tran043	7		1											8
Tran044	2							1				1		4
Tran045	11													11
Tran046	8	2	1											11
Tran047	9	5			2									16
Tran048	5							1						6
Tran049	5							4						9
Tran050	7		3					1						11
Tran051	5		7											12
Tran052	10		2											12
Tran053	3												1	4
Tran054	3			15										18

	Species[a]													
Transect	**PEMA**	**PETR**	**PEPA**	**DIOR**	**NECI**	**TAMI**	**TADO**	**MIMO**	**MILO**	**SPLA**	**SPMO**	**MUFR**	**ZAPR**	**TOTAL**
Tran055	20													20
Tran056	12		6											18
Tran057	7		10			1								18
Tran058	6		1											7
Tran059	12													12
Total	**612**	**12**	**155**	**22**	**22**	**25**	**2**	**14**	**3**	**10**	**1**	**1**	**6**	**885**
Relative Abundance	**0.69**	**0.01**	**0.18**	**0.03**	**0.02**	**0.02**	**0.001**	**0.02**	**0.001**	**0.01**	**0.001**	**0.001**	**0.01**	

[a] PEMA - *Peromyscus maniculatus*
PETR – *Peromyscus truei*
PEPA - *Perognathus parvus*
DIOR - *Dipodomys ordii*
NECI - *Neotoma cinerea*
TAMI – *Tamias minimus*
TADO – *Tamias dorsalis*
MIMO – *Microtus montanus*
MILO – *Microtus longicaudus*
SPLA – *Spermophilus lateralis*
SPMO – *Spermophilus mollis*
MUFR – *Mustela frenata*
ZAPR – *Zapus princeps*

Table 4. The list of voucher specimens collected during the course of trapping during the 2003 inventory. These species will be prepared and curated by the University of Washington Burke Museum of Natural History in Seattle, Washington.

Voucher#	UTMX	UTMY	UTMZ	Legal_Desc.	Date	Species[a]
050tran01CIRO	278458	4661564	1755	T15S R24E S32 NE1/4	030613	ZAPR
054tran02CIRO	278488	4661585	1768	T15S R24E S32 NE1/4	030613	MIMO
150tran05CIRO	274547	4662421	2025	T15S R23E S26 SE1/4	030607	MIMO
265tran14CIRO	278144	4663212	1906	T15S R24E S19 SE1/4	030716	PEPA
363tran16CIRO	274178	4662591	1632	T15S R23E S26 SW1/4	030724	TAMI
401tran17CIRO	274183	4662657	1633	T15S R23E S26 SW1/4	030725	TAMI
417tran21CIRO	278429	4661323	1638	T15S R23E S36 NW1/4	030725	TADO
436tran27CIRO	278095	4663277	1980	T15S R24E S31 NW1/4	030726	PEPA
496tran30CIRO	276420	4662625	1836	T15S R23E S24 SE1/4	030728	ZAPR
736tran47CIRO	278124	4663232	1921	T15S R24E S19 SE1/4	030820	PETR

[a] ZAPR – *Zapus princeps*
MIMO – *Microtus montanus*
PEPA – *Perognathus parvus*
TAMI – *Tamius minimus*
TADO – *Tamius dorsalis*
PETR – *Peromyscus truei*

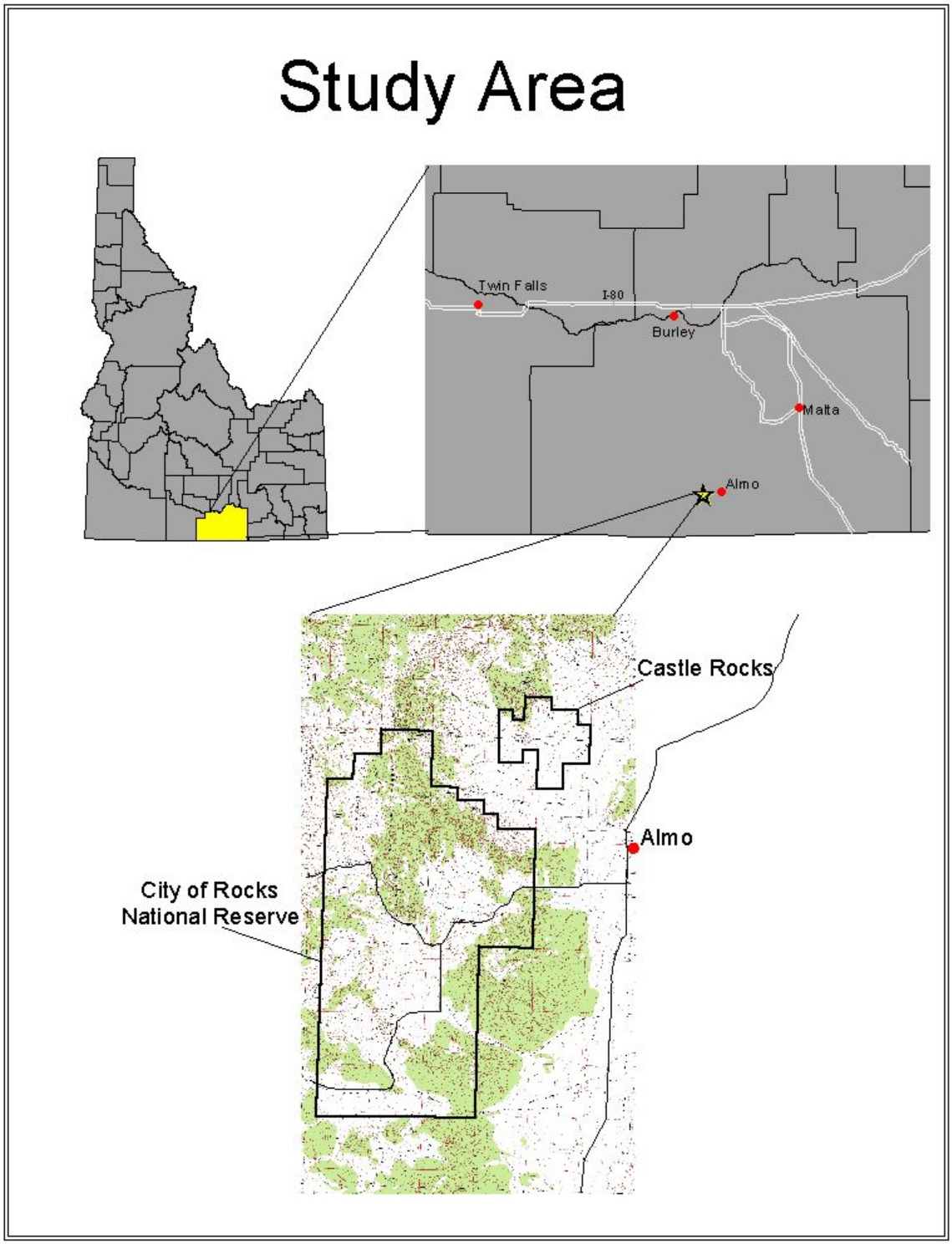

Figure 1. Study area map showing the southcentral region of Idaho: Cassia county, local cities, and the study area at the City of Rocks National Reserve and Castle Rocks.

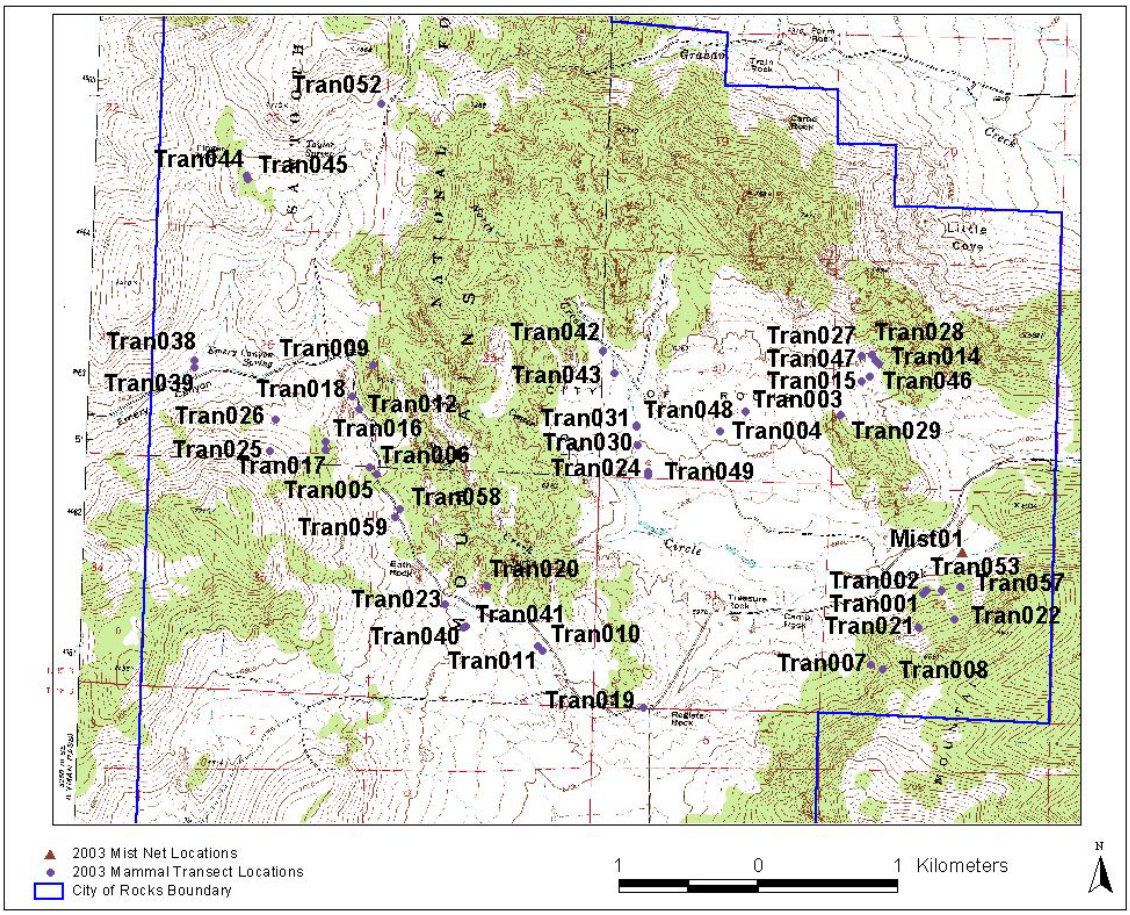

Figure 2. The location of 2003 mammal inventory capture efforts in the northern portion of the City of Rocks National Reserve.

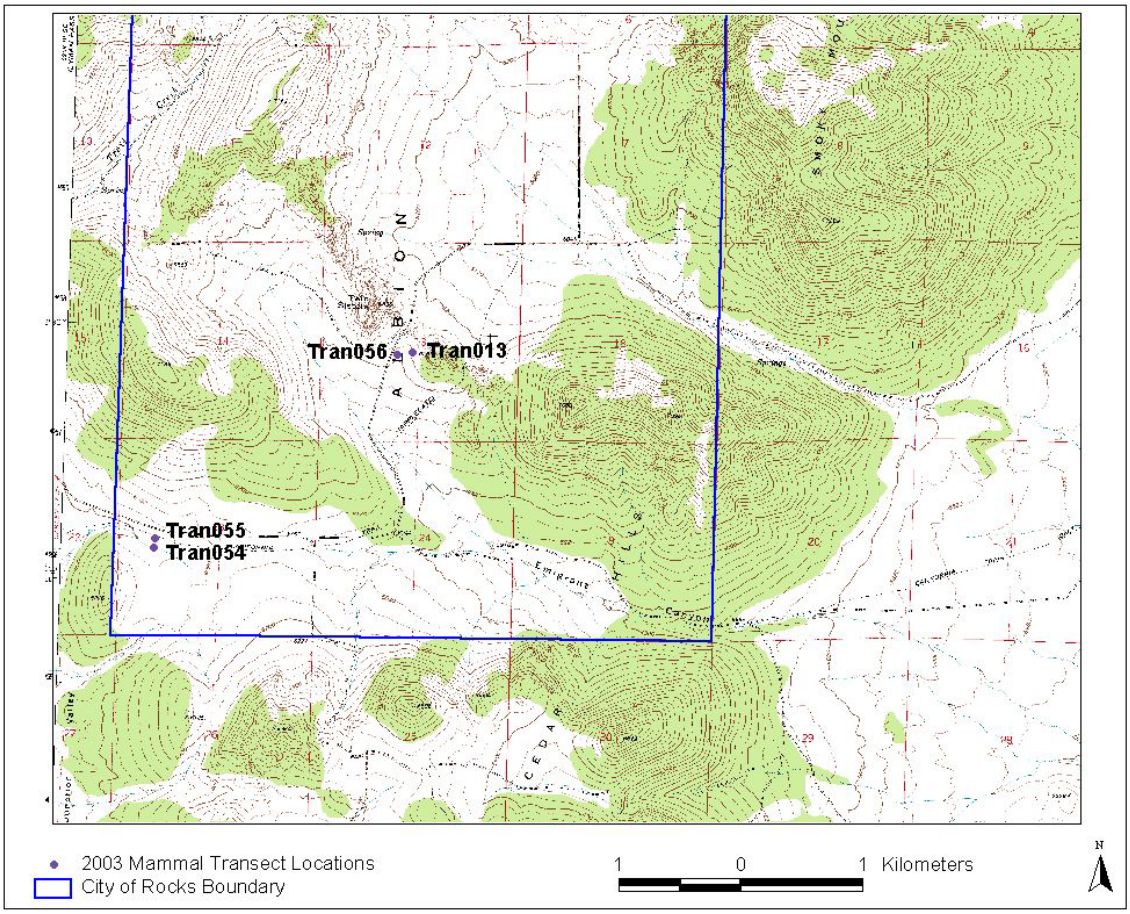

Figure 3. The location of 2003 mammal inventory capture efforts in the southern portion of the City of Rocks National Reserve.

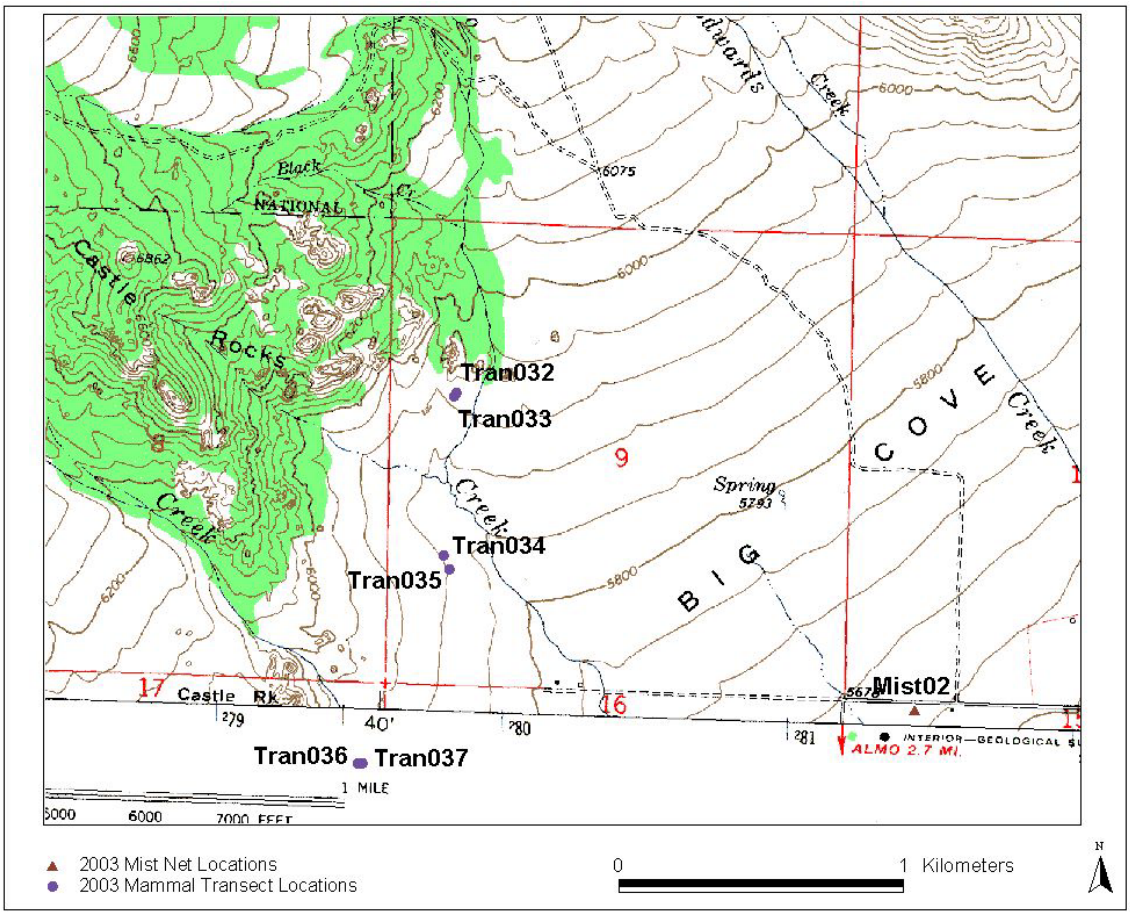

Figure 4. The location of 2003 mammal inventory capture efforts in the Castle Rocks area of the City of Rocks National Reserve.

Appendix A

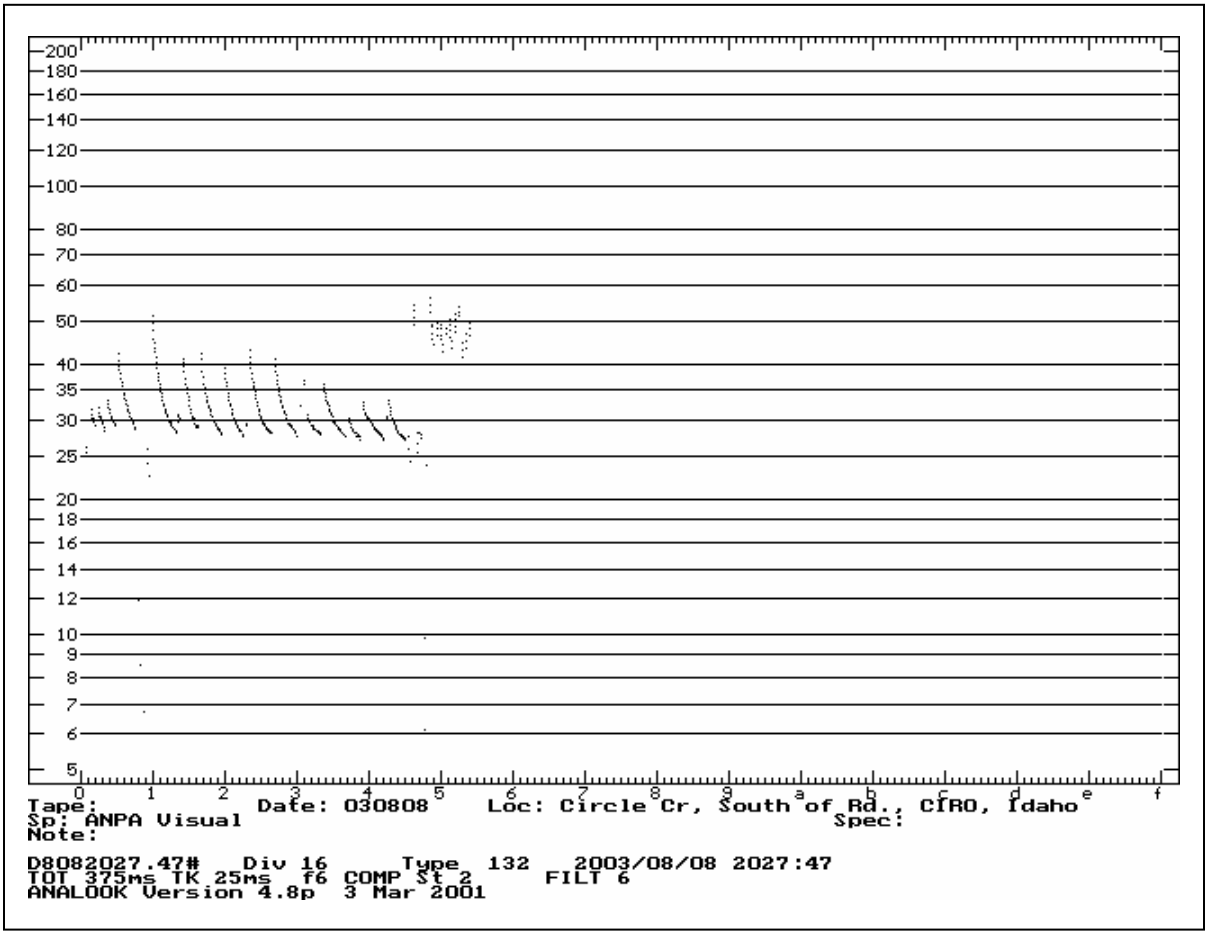

Figure A-1. A call sequence recorded from a pallid bat (*Antrozous pallidus*) observed flying over a small pool along Circle Creek on August 8, 2003.

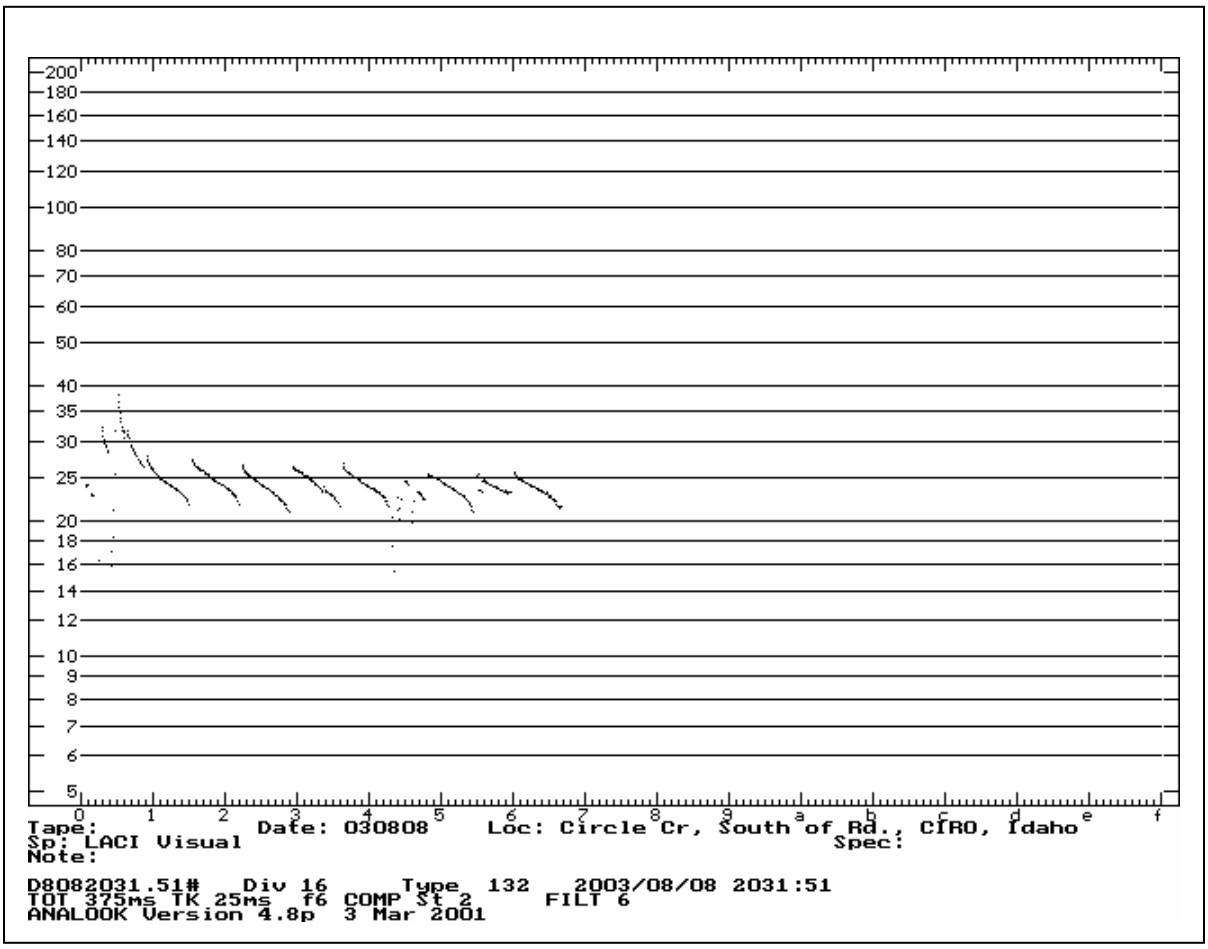

Figure A-2. A call sequence of a hoary bat (*Lasiurus cinereus*) recorded flying along Circle Creek on August 8, 2003.

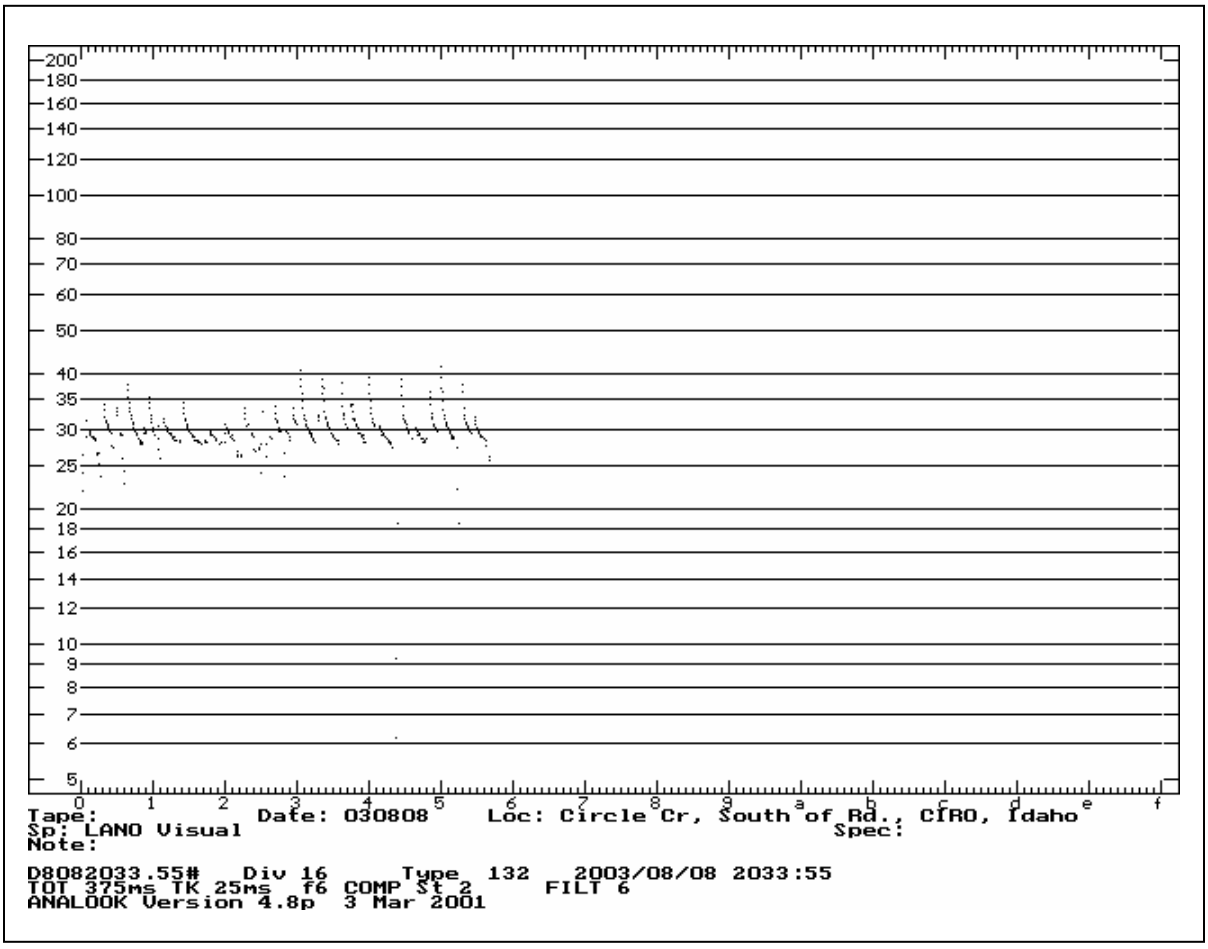

Figure A-3. A call sequence recorded from a silver-haired bat (*Lasionycteris noctivagans*) observed flying low over a pool along Circle Creek on August 8, 2003.

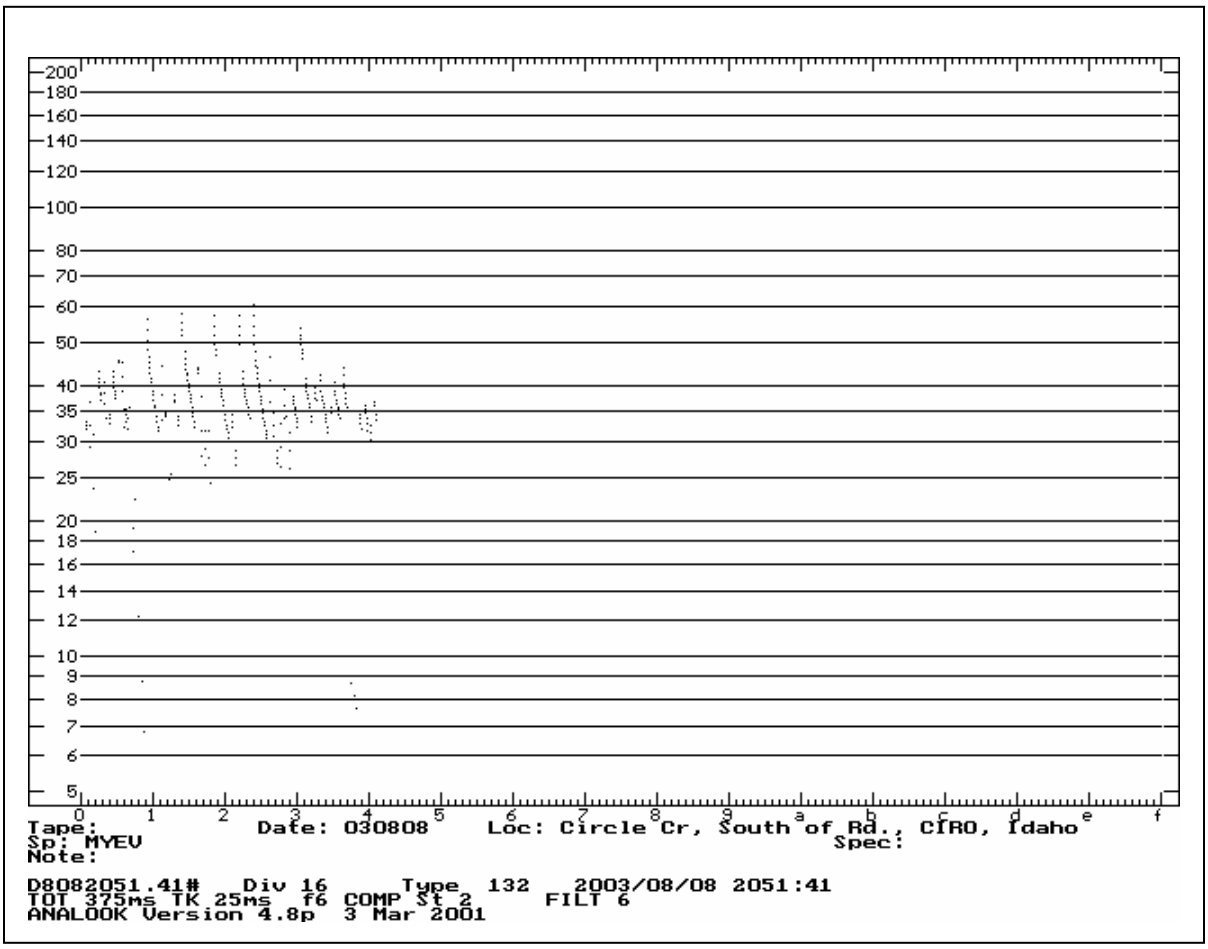

Figure A-4. A call sequence recorded from a long-eared myotis (*Myotis evotis*) flying along Circle Creek on August 8, 2003.

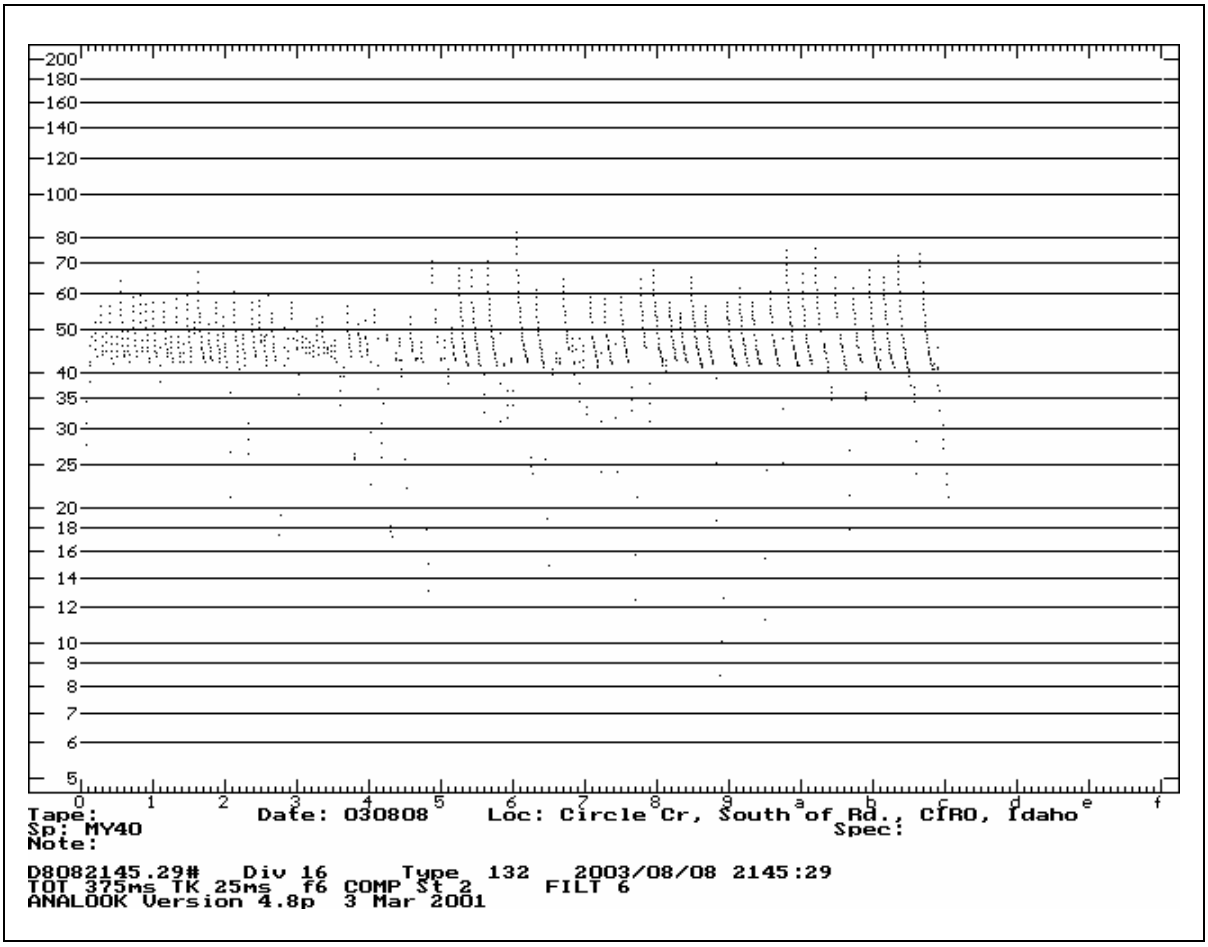

Figure A-5. A call sequence from a "40Khz Myotis". The long-legged (*Myotis volans*), little brown (*Myotis lucifugus*), and the western small-footed myotis (*Myotis ciliolabrum*), produce calls with a characteristic frequency at approximately 40 Khz and are difficult to differentiate using *Anabat*. All 3 of these species have been documented in City of Rocks National Reserve.

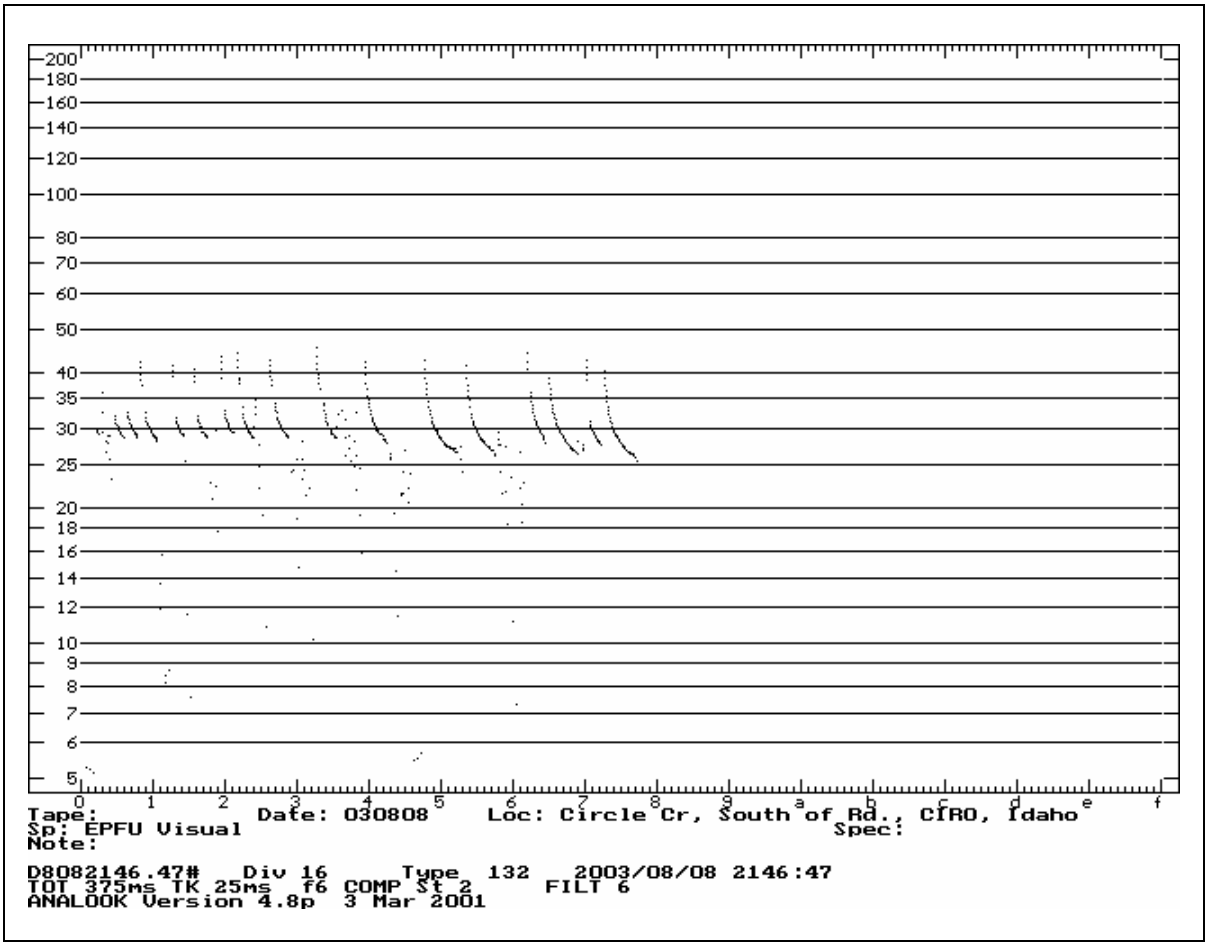

Figure A-6. A call sequence from a big brown bat (*Eptesicus fuscus*) observed flying high over Circle Creek on August 8, 2003.